*Total number of printed pages:*7 **D/4th/DCE401**

2021

STRUCTURAL ANALYSIS

Full Marks: 60

Time: 2 hours

The figures in the margin indicate full marks for the questions.

A. Multiple Choice Questions 1 x 20=20

1. Which of the following structural loads are not applied commonly to a building?
   a. Dead load
   b. Rain load
   c. Live load
   d. Wind load

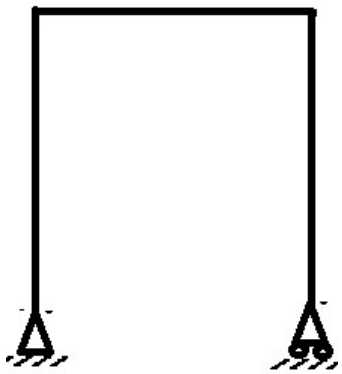

Fig.1

2. What is the number of reactions in fig.1?
   a. 1
   b. 2
   c. 3
   d. 4

3. What is the number of equilibrium equations in fig.1?
   a. 1
   b. 2
   c. 3
   d. 4
4. The structure in the fig.1 is
   a. Statically determinate
   b. Statically indeterminate
   c. Unstable
   d. All of these

Fig.2

5. What is the number of reactions of the structure in fig.2?
   1 1
   2 2
   3 3
   4 4
6. State the degree of indeterminacy of the structure in fig.2?
   a. 1
   b. 2
   c. 3
   d. 4
7. The structure in the fig.2 is
   a. Statically determinate
   b. Statically indeterminate
   c. Unstable
   d. All of these
8. A system is called a linear system if,
   a. Its material does not have linear stress-strain relationship.

b. Its material has linear stress-strain relationship.

c. Deformation is large.

d. Change of geometry cannot be neglected.

9. Internal hinges are used to make the structure,

a. Rigid

b. Flexible

c. To Increase the reactive stresses

d. To restrict the rotation

10. Internal hinges reduce the static indeterminacy and increases the

a. Internal indeterminacy

b. External indeterminacy

c. Kinetic indeterminacy.

d. None

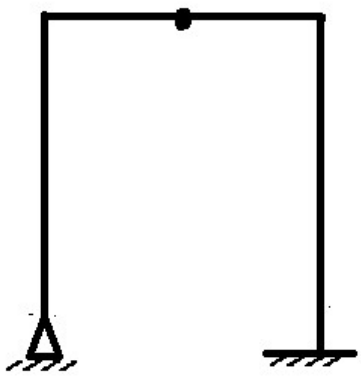

Fig.3

11. Determine the number of reactions of the structure in fig.3?

1 2

2 3

3 4

4 5

12. Determine the external indeterminacy of the structure shown in fig.3?

a. 1

b. 2

c. 3

d. 4

13. Determine the internal indeterminacy of the structure shown in fig.3?

a. 0

b. 1

c. 2

d. 3

14. Determine the degree of static indeterminacy of the structure shown in fig.3?

a. 0

b. 1

c. 2

d. 3

15. How many closed loops are there in the structure shown in fig.3?

a. 0

b. 1

c. 2

d. 3

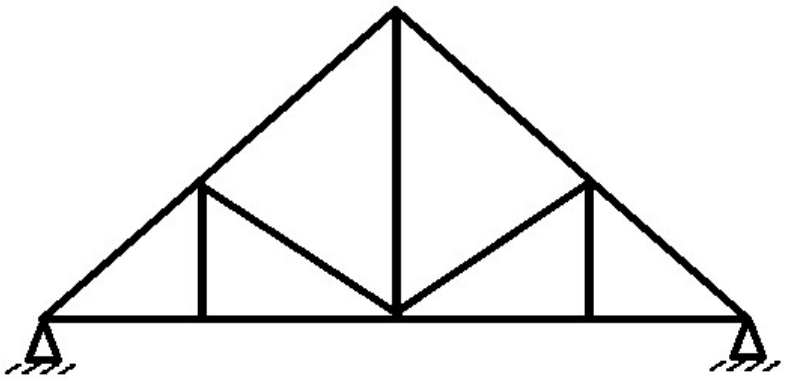

Fig.4

16. Determine the external indeterminacy of the structure shown in fig.4?

a. 1

b. 2

c. 3

d. 4

17. Determine the internal indeterminacy of the structure shown in fig.4?

a. 0

b. 1

c. 2

d. 3

18. What is the static indeterminacy of the structure shown in fig.4?

a. 0

b. 1

c. 2

d. 3

19. What is the degree of indeterminacy of the structure shown in fig.4?

a. 0

b. 1

c. 2

d. 3

20 A cable is a,

a. Flexible structure

b. Rigid structure

c. Semi rigid structure

d. None of the above

B. Very Short Question 2*6=12

Q A three- hinged arch has a span of 30m and a rise of 10m. The arch carries a uniformly distributed load of 60 kN/m on the left half of its span. It also carries two concentrated loads of 160kN and 100kN at 5m and 10m from the right end.

1. Determine the support reactions?
2. Determine the thrust at supports?

Q A simply supported beam of 6m carries a concentrated load of 15 kN at the mid span. (Use Castigliano theorem)

3. Find strain energy stored by the beam?
4. Find the central deflection?

Q A truss is shown in the figure below.

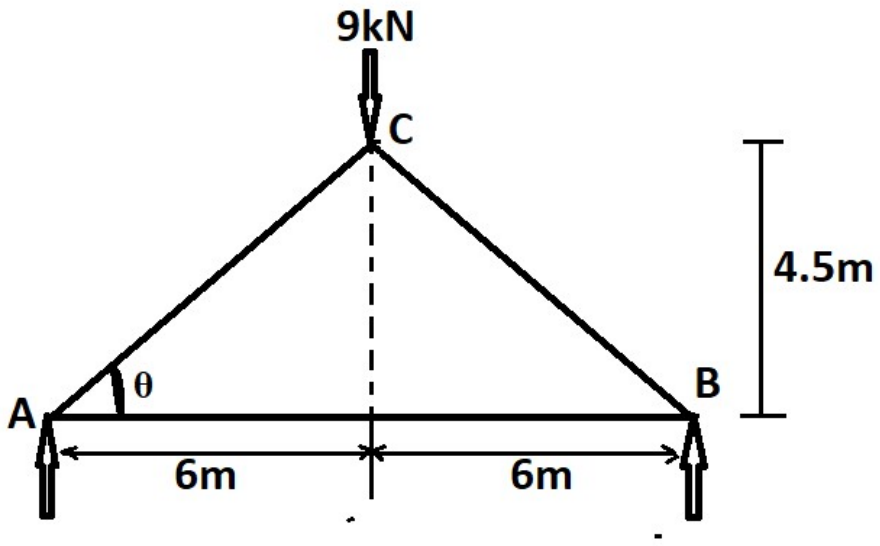

Fig.5

5. Determine R_A and θ. (Fig.5)

6. Determine F_{AC}. Also mention whether it is compressive or tensile? (Fig.5)

C Short Question 4*7=28

Q A beam AB of span 9m carries a point load of 120kN at a section C, 6m from A. the moment of inertia of the beam section is equal to I for the part AC and 2I for the part BC. (Use Conjugate beam method)

1. Determine the support reactions?

2. Determine slope at A?

3. Determine deflection at C?

Q A frame ABC shown in the figure has a concentrated load of 3 kN at C.

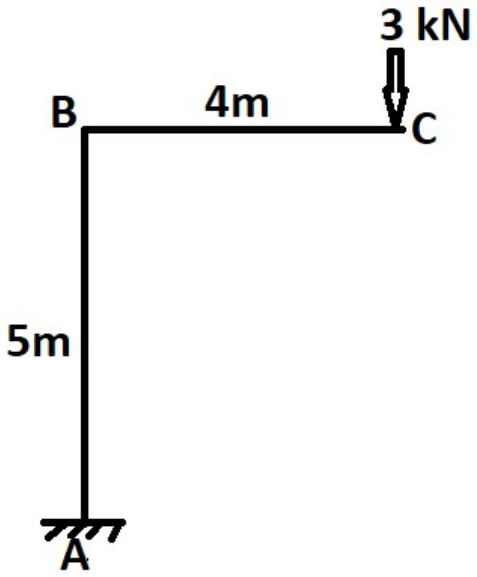

Fig.6

4. Determine the strain energy of the frame? (Fig.6)

Q A cantilever is shown in the figure. Take EI=4000kNm^2. (use moment area method)

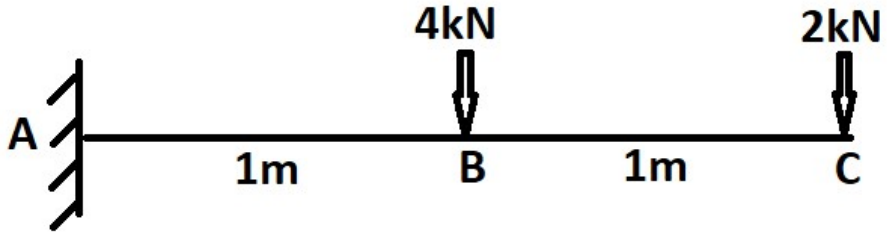

Fig.7

5. Draw the bending moment diagram. (Fig.7)
6. Determine the slope at the free end of the cantilever. (Fig.7)
7. Determine the deflection at the free end of the cantilever. (Fig.7)